Global Journal of Economic and Finance Research

e-ISSN: 3050-5348
p-ISSN: 3050-533X

Vol. 01(05):80-85, October 2024

Home Page: https://gjefr.com/index.php/gjefr

The Importance of Data Analytics in Modern Fashion Industry

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KEYWORDS: Data analytics, Big Data analytic, modern fashion industry.

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Publication Date: 21 Oct.-2024
DOI: 10.55677/GJEFR/04-2024-Vol01E5

ABSTRACT

The growth of the internet and the abundance of data it currently offers has caused one of the most significant developments in recent years. Fashion data scientists can now examine and benefit from a multitude of information because of the introduction of social media. These tips are invaluable for fashion campaign managers and designers. This paper examined the importance of data analytics in modern fashion industry. The paper collected secondary data from existing journals, articles, and companies' blogs and websites. The overall result from this study indicates that data analytics have significant roles in modern fashion industry. For one thing, decision making in relation to customers' needs and expectation, trend, quality, etc are based on data collected through different means. Thus, the fashion retail market is a quickly evolving field, with trends shifting within a few years. Intuition and gut feelings alone are not enough. In order to adapt to shifting consumer tastes and preferences, the fashion industry needs a data-driven, analytical approach.

INTRODUCTION

The trend of more digital commercial activities is not exclusive to fashion enterprises. Many new information sources have been easily accessible to fashion firms with the advent of data-gathering technology like as mobile devices, the Internet, and social networking services (SNS) (Kauffman, Srivastava, & Vayghan, 2012). A major shift in recent history has been brought about by the expansion of the internet and the deluge of data it now provides. Fashion data scientists can now examine and benefit from a multitude of information because of the introduction of social media. These tips are invaluable for fashion campaign managers and designers. They may be collected by tracking post interaction, Twitter hashtags, Instagram trends, popular vlogger wardrobes, and celebrity "likes" and "reactions".

The fashion retail market is a quickly evolving field, with trends shifting within a few years. Intuition and gut feelings alone are not enough. In order to adapt to shifting consumer tastes and preferences, the fashion industry needs a data-driven, analytical approach (Amatulli et al., 2016). Despite the many benefits of the internet, e-commerce, and technology, the fashion industry has taken a major hit.

In order to thrive in a data-driven world and become more competitive, businesses need to be exceptionally adept at gleaning meaningful insights from their current data and turning those insights into practical procedures (Kauffman et al., 2012). The fashion industry is always changing, mostly as a result of the transient nature of fashion items and the unpredictable nature of customer demand (Ren, Hui, & Choi, 2018). In order to be competitive, fashion enterprises need to swiftly modify their strategy to match shifting market requirements and technology breakthroughs (Lake, 2018; Thomassey & Zeng, 2018).

The question of what went wrong arises in light of this. Problematically, businesses in the retail sector are notoriously slow to embrace and implement new technological innovations. Many famous businesses used to go under the radar, keeping key information under wraps and playing their cards close to their chest. Fashion firms may not think to closely observe rivals or keep an eye on what their consumers really wanted to purchase; instead, they would base judgment about the colours, prices, styles, and fits of their clothing on unstructured data.

Many fashion firms lost out on important information about pricing, trends, insights, and other essential facts because they used the outdated closed-book style of retail data analysis. Given the tremendous rivalry in the fashion industry and the need of being current, this may seem odd, yet firms waited a long to start adopting technology.

Amazon transformed everything. The retail behemoth began prioritising data science with new technologies like artificial intelligence and machine learning. Amazon stayed ahead by using big data to know what was popular and when. Fashion companies had to sit up, notice, and change their approach. Recent market changes have made data science more crucial to the fashion industry than ever. Data scientists with particular expertise may now predict a new collection's success by evaluating past sales data.

Consequently, this aids businesses in making sure their funds are allocated prudently. Similarly, marketers are now able to foresee trends before they become popular by using ideas from visual search, natural language processing, predictive algorithms, and structured photographic data. They may then create custom designs that they are certain will appeal to a specific market as a consequence. In the past, businesses would have used focus groups to make this kind of prediction, determining whether or not a collection would be successful. Currently, well-known companies like as Ralph Lauren employ "actionable product intelligence" to ascertain how variations in product fabric, price, colour, and design aspects impact a customer's reaction. All of this happens before the product is ever designed, which lowers expenses and lowers the possibility that it won't succeed.

The shift from gut feeling to data-driven fashion is a pattern that emphasises customer connection, not a fad. Data provides unrivalled insights into customer behaviour, market trends, and demand patterns, helping fashion companies and retailers develop the best production and sales strategy. Data-driven strategies improve decision-making and allow firms to provide more tailored products.Data analytics may help fashion firms improve customer happiness, revenue, and waste. This increases customer lifetime value, making the firm model more profitable and sustainable. Data is essential in the fashion industry, where profitability, sustainability, and efficiency are paramount.In the competitive fashion industry, data-driven decisions are smart and essential for development and success, particularly for those transitioning from physical shopfronts to e-commerce.

Zhao and Kim (2021) said data will provide insights to adapt and reengage customers. Companies in the fashion and luxury industries, in particular, who use data into their supply-chain, planning, and merchandising procedures often see observable outcomes. Sales will rise as a result of data-driven stock and store optimisation choices. Improved visibility throughout the whole supply chain will also save inventory costs by streamlining inventory management, improving return forecasts, and optimising transport networks. Although it is clear that data and analytics may significantly increase the value of e-commerce purchases, there is still room for improvement in physical sales. As we move towards an omnichannel world after the COVID-19 pandemic, companies must be adaptable enough to react quickly to changing consumer demands.

For many high-end and trendy brands, data management is a weakness. When beginning an analytics journey, the lack of clear taxonomies and high-quality data, as well as the overall lack of knowledge and consistent language surrounding data within the organisation, cause disaster. This paper reviews the literature on fashion data analytics applications and provides examples and discusses their pros and cons. This paper was motivated by the dearth of literature on apparel companies' advanced data analytics and its expanding popularity.

The purpose of this essay is to provide academics and professionals in the fashion business a basic understanding of data analytics as it pertains to the industry. Furthermore, it provides motivation for using suitable methods of data analysis in both academic and business endeavours.

Statement of research problem

Fashion has always been driven by creativity, imagination, and intuition. Designers built collections based on creativity, market research, and industry trends without considering customer demand or market volatility. Although innovative, the previous manufacturing approach caused overproduction, inventory management issues, and lost opportunities. Welcome to data-driven fashion production, a revolutionary technique that is changing how fashion firms operate and making luxury apparel affordable for everyone. Unlike traditional fashion production, data-driven fashion production uses insights and data analysis to guide production and manufacturing.

Data are available in greater quantities than before, and the COVID-19 pandemic has strengthened the need for developing data capabilities. Although there are many, diverse, and well-known use cases for data and analytics, it's not always clear where to concentrate along the value chain. Determining the best location and method for cross-functional data integration into the company, as well as developing the necessary operational model, may be difficult.

There are a plethora of new research questions cropping up in the fashion industry, such as how to effectively forecast both short-term and long-term trends, how to optimise algorithms to meet consumer demands, how to present fashion products in virtual spaces, how to increase the number of social media users who see and engage with posts from fashion companies and fashion media, and how to understand the complete nature of fashion event cycles. However, researchers in the fashion industry have not yet made full use of data science and large-scale datasets.

The roles and importance of data analytics

As an initial stage in data analytics, descriptive analytics seeks to summarise data in a logical and descriptive way to understand market occurrences. The next step in big data analytics is predictive analytics, which uses a combination of traditional statistics and machine learning methods such as neural networks, sentiment analysis, NLP, and more to glean new insights from data and offer suggestions for possible scenarios. Kovacevic (2018). Big data, low-cost, high-performance computers, and machine learning

algorithms have revolutionised a number of sectors, including fashion, by enabling the extraction of valuable insights from a wide range of data sources. The fashion industry has begun to realise the need of monetising data via the use of big data analytics to strategic and operational decision-making in the mid-2010s. Ecommerce companies used to place a higher emphasis on data analytics because they operated on digital platforms and had established systems in place to efficiently gather information about online customer behaviour. Fashion manufacturers and retailers have recently begun using their internal data to boost sales and profitability while maintaining their competitiveness in the market (Zhao & Kim, 2021).

The primary challenge that companies have when trying to collect and analyse internal data is the prevalence of data silos, which are defined as the physical separation of data created by different parts of an organisation. Effective data utilisation is impossible in the absence of data integration. Following the consolidation and cleansing of data from various sources, it is necessary to choose suitable data metrics that are both quantifiable and closely related to the objectives of the companies.

Even in the fashion industry, data analytics have the potential to shift focus from top-down to bottom-up segmentation. Gruzbarg proposed four features to facilitate "behavioural and contextual targeting" using data analytics:

a. Demographics such as income, gender, or age are used to understand the consumer.

b. Purchase transactions, cart abandonment, and other historical and behavioural data are used to understand the client's previous behaviour and may be used to anticipate future actions.

c. Contextual and streaming data, such as a client's recent online activities, the websites they are visiting, the emails they recently opened, the advertisements they clicked on, and the products they are interested in, may be used to determine if a consumer is in the purchasing mode at the moment.

d. AI-powered predictive analytics can identify hidden patterns in the first three dimensions and forecast consumer behaviour. Data-driven segmentation may help fashion companies tailor items and advertising (Sun, 2021). Retailers and fashion companies have clearly come to see the importance of data analytics for making business decisions. The company has to put in more effort to make good use of the data it already possesses. In addition, it is possible to broaden the scope of data analytics to include working with tech partners who provide various AI-based solutions in order to resolve business difficulties.

The roles of data analytics in the fashion industry

The current fashion industry has access to a wealth of data about sales, goods, and consumers due to continuous data collection and analysis. Experts in the field have long recognised the value of data in increasing sales and profitability, particularly for fashion businesses and stores that depend on eye-catching designs for their merchandise (Zhao & Min, 2019). Data analytics and machine learning are helping fashion companies utilise AI-powered applications and software to better design, retailing, and marketing. Traditional fashion organisations and merchants use their specialists' intuition to make judgements rather than modern data analytics. In contrast, numerous online retailers and giants like Amazon have been investigating how to use sophisticated data analytics to boost HR, merchandising, marketing, operations, channel management, and product development and design.Still, there are indications that the fashion industry is becoming serious about using big data and analytics (Keunyoung, 2020).Businesses and merchants in the fashion industry are primarily interested in data analytics optimisation as a means to improve product offerings via precise customer personalisation. Long-term, this technique should increase sell-through and profitability.

A quarter of the fashion industry's manufacturers and retailers want to invest $50 million in customer-focused data science over the next five years, according to JDA Software Inc. (2018). This spending will be utilised to generate lifestyle and geographically appropriate product assortments based on consumer data (Keunyoung, 2020).Data analytics and AI are simplifying design and sales in online and brick-and-mortar apparel retailers.The analytics used in the fashion retail industry are the focus of this study. Data analytics, machine learning, and artificial intelligence are frequently used interchangeably, which is why researchers are looking at AI-based retail applications. Also included is the level of data literacy among college-level fashion majors.

A growing need for fashion-specific data analytics program

To address demand for data-driven insights and AI-based solutions, fashion retailers hire data analysts. Digital data helps fashion experts predict customer behaviour and increase revenue.

Fashion United reports that Pandora, Nike, Under Armour, and Sweaty Betty data analysts analyse digital channel data, identify trends, and educate management.

Specifically, data analysts in the fashion industry may have a degree in a STEM area, but they must also be well-versed in fashion retailing, consumer behaviour, and merchandising in order to accurately forecast trends and understand their customers better. Fashion retailers and companies looking for new hires should favour applicants with data analytics and fashion fundamentals abilities.

Artificial intelligence (AI) includes computer vision, machine learning, deep learning algorithms, augmented reality (AR), virtual reality (VR), machine learning (ML), and more. The data analytics process may benefit from the use of AI-based merchandising tools by fashion firms and retailers, leading to more accurate responses to their business queries. Data analytics procedures have been outsourced to digital businesses backed by artificial intelligence, such as Content square.

Some significant data analytics to be implemented in the Fashion data analysis.

Time series, regression, and multiple component analysis are used for fashion sales forecasting, garment manufacturing decisions, and textile sensory evaluation. These methods are effective for structured data analysis and linear variable connections (Xue, 2018). Text, photo, and quantitative fashion data from customer reviews, social media, and sales records might be organised, semi-structured, or unstructured. Due to complicated nonlinearity between variables, classical techniques fail to analyse semi-structured and unstructured data, losing crucial information (Jelil, 2018; Xue, 2018).

Traditional methods also have strict data set size and dispersion requirements (Xue et al., 2018). Traditional methods for complete analysis of small or large data sets, such as new product sales estimates without past sales data, are difficult (Tan et al., 2015). Real-time insights cannot be achieved with daily, weekly, or monthly data integration and analysis. Companies must use real-time data to preserve value in the massive amounts of data produced every second (Liu, Iftikhar, & Xie, 2014).

Due to its complexity and intelligence, big data analysis has been popular in recent decades (Acharya et al., 2018). The four Vs of big data are v*olume, velocity, variety, and value* (Acharya et al., 2018) are essential in the fashion data analysis.

Volume relates to enormous amounts of data, *velocity* to speed and frequency, and diversity to forms and sources represent *variety*. *Value* underlines the insights that data may provide. Digital data is complicated, matching big data's four traits (the 4Vs) are essential in the fashion industry. For instance, Marr (2018) claims over 40,000 Google queries per second, demonstrating big data's speed.

Included in the category of "fashion big data" are the following: social media, GPS signals, sales data, photos from smart clothing sensors, physiological data, and Google Trends and Analytics.

Big data helps fashion companies solve difficulties and compete (Acharya et al., 2018). Big data analytics requires sophisticated technology and organisational flexibility (Acharya et al., 2018).

With the advancement of computer technology, AI-based tactics are outperforming pure statistical approaches when it comes to data insights. Xue (2018) states that AI-based systems can manage organised, semi-structured, and unstructured data, as well as analyse data well, handle nonlinear difficulties and noise, and adapt to different database distribution and size requirements. A wide range of topics are referenced, including genetic algorithms, fuzzy logic, machine learning, and more. According to Louridas and Ebert (2016), machine learning enables computers to automatically learn from training data and apply that knowledge to new data sets. According to Sze et al. (2017), neural networks are used by a substantial amount of AI technology. Artificial neural networks are driven to learn from input data by mathematical learning theories and biological brain activity (Goodfellow et al, 2016). Neural network architecture is controlled by processing unit organisation. Deep neural networks, which simplify complex translations into layers, are used by computers to assess input data (Sze et al., 2017; Goodfellow et al., 2016).

Garment design, fashion-item image identification, clothing production decision-making, and fashion retailing benefit from advanced data analytic techniques. Data-driven management is sweeping organisations as big data becomes more accessible and analytical tools improve (Acharya et al., 2018). Innovative approaches are crucial to fashion business success, but not all use them. Open-source tools are becoming more accessible, yet complicated data analysis methods need advanced technology (Akter et al., 2016). According to Porter and Gogan (2013), in order for companies to succeed, they need to gather the necessary technology and human resources, change their focus from people to data, and set aside more resources. Data analytics and applications pose potential privacy and security problems, and there aren't many practices in the fashion business that use complex data analysis.

The data analytics boom and the scarcity of studies on fashion retailers' use of intelligent data analytics inspired this study to evaluate six organisations' methods and discuss their pros and cons. This article provides a detailed assessment of fashion industry data analytics, motivating executives and academics to utilise relevant methods in their businesses and research.

Some Examples of Real-World Data Analytics Inventory Optimisation

Nike: Data analytics improves demand forecasting models at Nike, decreasing inventory and maintaining product availability. Using machine learning techniques, Nike optimises their inventory across geographies and channels. This aids its ability to analyse sales data, customer patterns, and external factors such as weather in order to enhance efficiency and decrease waste.

H&M: Analytical tools enhance global inventory management.Companies may alter production and distribution depending on real-time sales. This reduces overstocking and makes popular items affordable, pleasing customers.

Zara: Fast-fashion brand Zara tracks worldwide sales and customer feedback using advanced analytics.Zara adjusts production and delivery live. Fast trend reaction helps Zara. This shows data analytics' fashion supply chain and inventory management potential. Data may help fashion firms balance client demand with sustainability. Because of this, fashion companies lead in sustainability and efficiency, improve operations, and save costs.

CONCLUSION AND RECOMMENDATIONS

The review so far indicates that modern fashion's various channels generate massive amounts of data every second. Data analytics is crucial for organisations and retailers since it may reveal consumer behaviour, inventory management, price tactics, product assortment planning, and more.Recent consumer choices have been more flexible and unpredictable.Marketing campaigns, pricing policies, e-commerce impact, payment methods, product and service accessibility and availability, experiential marketing,

environmental and sustainability concerns, generational differences, personal experience, and economic conditions affect these preferences.

These characteristics make the market unstable and ever-changing, affecting customer preferences and decisions. Analysing data from internet businesses, social media, brick-and-mortar stores, and third-party reports may reveal such developments. Retail management and its direction are heavily influenced by data analysis. Retail data analytics aims to provide product trends, consumer purchasing habits, sales patterns and history, footfall patterns, inventory mapping, price implications, and sales and inventory data. With this study, you may predict results, make purchase plans, detect current and future trends, regulate inventory levels, discounts and promotions, OTB (open-to-buy), and make wise business choices. Data analytics helps designers plan numerous lines and optimise product mix to boost sales and reduce inventory waste. They may also locate sustainable production vendors and suppliers for retailers.

The study recommends that data analytics should be the key to promoting sustainability and ethics in fashion. This will go along way in reducing waste and improving reusability. Through information elicited from data analytics, the sector will be able to enhance customer satisfaction.

Customers needs and expectations should be personalised to increase demand. Thus can be achieve through hyper-Personalization. In this case, data analytics might allow on-demand custom-fit apparel, minimising waste and improving consumer happiness. Creative and technological AI-driven design tools may allow customers to co-create their own artworks.

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